REMARKS

Applicant concurrently files herewith an Excess Claim Fee Payment Letter and fee for excess dependent claims.

Claims 1-42 are all the claims presently pending in the application.

New claims 37-42 have been added to more completely define the invention.

It is noted that the claims have been amended solely to more particularly point out Applicant's invention for the Examiner, and not for distinguishing over the prior art, narrowing the claim in view of the prior art, or for statutory requirements directed to patentability.

It is further noted that, notwithstanding any claim amendments made herein, Applicant's intent is to encompass equivalents of all claim elements, even if amended herein or later during prosecution.

Attached hereto is a marked-up version of the changes made to the Specification and/or claims by the current Amendment. The attached pages are captioned "**Version with markings to show changes made**".

Claims 1-36 are rejected under 35 U.S.C. § 102(b) as being anticipated by Chapple-Sokol et al. (U.S. Patent No. 5,465,859) (hereinafter "Chapple").

This rejection is respectfully traversed in view of the following discussion.

I. THE CLAIMED INVENTION

Applicant's invention, as defined for example in independent claim 1 (and substantially similarly in independent claims 12 and 23) is directed to a method of etching a substrate which includes measuring a reflectance signal from a reflective material deposited on the substrate as the substrate is being etched.

A feature of the present invention, in a non-limiting embodiment is that a reflective material may be isolated from an etching process.

With the unique and unobvious method of the invention, a reflectance correlation may be obtained between a primary film being etched and a secondary film being used only to correlate and trigger an endpoint on the primary film. Thus, the output being monitored for

endpoint detection does not require physically representing the film being etched. Such a feature results in an improved turn-around-time, low cost, improved efficiency, and improved manufacturability (e.g., see page 5, lines 13-20; page 7, lines 5-20; and page 9, lines 1-12).

An exemplary configuration of the present invention is shown being applied to a structure in Figures 4A, 5A, and 6A of the application.

The conventional methods, such as those discussed in the Related Art section of the present application, fail to provide for such an operation nor do they have such a structure.

III. THE PRIOR ART REFERENCES

A. The Chapple Reference

The Examiner asserts that:

> *[Regarding claims 1, 12 and 23] Chapple-Sokol discloses a method of etching a substrate, comprising: measuring a reflectance signal from a reflective material 7 deposited on said substrate 8 as the substrate is being etched (Fig. 1f, col. 3, lines 24-26); correlating the substrate etch rate to the reflective material; and using the etch relation between the substrate and the reflective material to determine the etch target, wherein said reflective material 7 is isolated from an etching process (by mask 9, an oxide, and by chrome's native oxide, Fig. 1b).*

However, Applicant respectfully disagrees.

Specifically, in a non-limiting embodiment of the present invention, the method of the invention, as shown in Figs. 4A, 5A, and 6A, is applied to a structure with a substrate 41 (e.g., primary film), a metal layer 42, a metal oxide 43 (e.g., secondary film), and a resist 44 in that order. As shown in Figs. 4A, 5A, and 6A, as the metal oxide 43 is etched, the etch relation (e.g., shown in Figs. 4B, 5B, and 6B) is determined by a rate of the metal oxide etch.

A laser 45 emits a signal passing though the metal oxide 43 as it is being etched and strikes metal 42. The change in the measured reflectance signal from the metal 42, as the metal oxide 43 is etched, is correlated with an etch rate of the substrate 41 to determine the

etch target.

Thus, in the present invention, a reflectance correlation may be obtained between a primary film being etched and a secondary film being used to correlate and trigger an endpoint on the primary film. The output being monitored (e.g., the reflectance from metal 42 as a metal oxide layer 43 is being etched) does not physically represent the film being etched (e.g., substrate 41).

In complete and fundamental contrast, Chapple is entirely different and does not teach or suggest the novel features of the present invention.

For example, with reference to Fig. 1b Chapple discloses *"oxide 9 and quartz 8 are dry etched.....using the oxide at location 13 as a monitor for etch endpoint detection"* (e.g., see column 3, lines 20-24). Chapple only discloses an oxide layer 9 at location 13 as a monitor, not a metal oxide layer as in claimed invention. Thus, Chapple is unable to (e.g., and indeed does not) teach or suggest *"the etch relation is determined by a rate of a metal oxide etch"*(emphasis Applicant's), as defined by independent claims 1, 12, and 23.

Further, Chapple discloses that *"[t]he oxide thickness is pre-established to take into account the slightly different etching rates so that when the oxide 9 is fully removed the depth of the quartz recesses 14 is the desired amount"* (e.g., see column 3, lines 26-29 of Chapple). Thus, while the Examiner asserts in the Office Action that "there is an inherent direct correlation between the reflectance of the oxide 9 and the substrate etch rate since Chapple-Sokol determines the endpoint of the process based on when the oxide 9 has cleared" (e.g., see page 3 of the Office Action), this is completely different from the claimed invention.

Specifically, even assuming (arguendo) that the Examiner's assertions are correct, in the present invention it is a metal oxide which determines an etch relation and the etch target, not an oxide alone. Thus, Chapple is unable to teach or suggest that *"a change in a measurement of said reflectance signal is determined by a rate of said metal oxide etch"*, as defined by new dependent claims 37-39.

Further, while the Examiner asserts "the native metal oxide is expected to inherently be present" (e.g., see page 3 of the Office Action), Chapple does not disclose that native metal oxide determines when the depth of the quartz recesses 14 is a desired amount. Instead, Chapple relies upon the oxide 9, and specifically the complete removal of the oxide 9. Therefore, Chapple does not teach or suggest *"said etch target is determined before said*

metal oxide is completely removed", as defined by new dependent claims 40-42.

Thus, turning to the language of the claims, there is no teaching or suggestion by Chapple of the novel present invention in which "*[a] method of etching a substrate, comprising:*

measuring a reflectance signal from a reflective material deposited on said substrate as the substrate is being etched;

correlating the substrate etch rate to the reflectance signal from the reflective material; and

using the etch relation between the substrate and the reflective material to determine the etch target,

wherein said reflective material is isolated from an etching process, and

wherein the etch relation is determined by a rate of a metal oxide etch" (emphasis Applicant's) as recited in independent claim 1 (and substantially similarly in independent claims 12 and 23).

Further, dependent claims 2-11, 13-22, and 24-36 (and new claims 37-42) when taken in combination with claims 1, 12, and 23 define additional novel limitations.

III. FORMAL MATTERS AND CONCLUSION

Regarding the drawings objection, Applicant herewith submits a Submission of Proposed Drawing Corrections to label Figures 1A-3B as "Related Art", as requested by the Examiner.

Minor errors have been corrected in the disclosure.

In view of the foregoing, Applicant submits that claims 1-42, all the claims presently pending in the application, are patentably distinct over the prior art of record and are in condition for allowance. The Examiner is respectfully requested to pass the above application to issue at the earliest possible time.

Should the Examiner find the application to be other than in condition for allowance, the Examiner is requested to contact the undersigned at the local telephone number listed below to discuss any other changes deemed necessary in a telephonic or personal interview.

The Commissioner is hereby authorized to charge any deficiency in fees or to credit any overpayment in fees to the assignee's Deposit Account No. 09-0456.

Respectfully Submitted,

Date: 6/30/04

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

The paragraph beginning on page 5, line 18 has been replaced with the following with the following paragraph.

– Generally, the invention [take advantages] takes advantage of a metal film (e.g., a chrome film) which is already on a photomask used with the etching process. For purposes hereinbelow, chrome will be assumed to be the metal film, but of course, as would be known by one [originally] ordinarily skilled in the art after taking the present specification, any metal (or other opaque material) providing a predetermined reflectance signal could be used. The surface of the chrome film contains an anti-reflective chrome oxide which isolates the chrome from the etching process. This film is etched during the quartz etch process. By correlating the quartz etch to the rate of the chrome oxide etch, the reflectance signal from the chrome can be used to determine an endpoint for the quartz etch process. –

IN THE CLAIMS:

The claims have been amended as follows:

1. (Twice Amended) A method of etching a substrate, comprising:

measuring a reflectance signal from a reflective material deposited on said substrate as the substrate is being etched;

correlating the substrate etch rate to the reflectance signal from the reflective material; and

using the etch relation between the substrate and the reflective material to determine the etch target,

wherein said reflective material is isolated from an etching process, and

wherein the etch relation is determined by a rate of a metal oxide etch.

7. (Twice Amended) The method of claim 1, wherein said reflective material comprises metal having [a] said metal oxide thereon, and said substrate etch also etches said metal oxide on said metal, and wherein the reflectance correlation uses said metal as a secondary film only to correlate, and trigger an endpoint on the substrate as a primary film being etched,

wherein an output being monitored for endpoint detection is not physically representing the primary film being etched.

12. (Twice Amended) A method of etching a material, comprising:

measuring a reflectance signal from a correlation material that is removed from the path of a second material that is to be etched as the second material is etched;

correlating the second material etch rate to the reflectance signal from the correlation material; and

using the etch ratio between the correlation material and the second material to determine the etch target,

wherein said correlation material is isolated from an etching process, and

wherein the etch ratio is determined by a rate of a metal oxide etch.

18. (Twice Amended) The method of claim 12, wherein said second material etch also etches [a] said metal oxide on said metal, and wherein a thin film reflectance correlation uses said metal as a secondary film only to correlate, and trigger an endpoint on the second material as a primary film being etched,

wherein an output being monitored for endpoint detection is not physically representing the primary film being etched.

23. (Twice Amended) A method of etching a semiconductor substrate, comprising:

measuring a reflectance signal from an opaque material deposited on said semiconductor substrate as the semiconductor substrate is being etched;

correlating the semiconductor substrate etch rate to the reflectance signal from the opaque material; and

using the etch relation between the semiconductor substrate and the opaque material to determine the etch target,

wherein said opaque material is isolated from an etching process, and

wherein the etch relation is determined by a rate of a metal oxide etch.

29. (Twice Amended) The method of claim 23, wherein said opaque material comprises metal having [a] said metal oxide thereon, and said substrate etch also etches said metal oxide on said metal, and wherein the reflectance correlation uses said metal as a secondary film only to correlate, and trigger an endpoint on the substrate as a primary film being etched,

wherein an output being monitored for endpoint detection is not physically representing the primary film being etched.